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tion formulas, 70–72; XII: Deflection formulas, 73–75; XIII: Rotation of the earth, 76–82; XIV: Computation of differential corrections, 83–90; XV: Weighting factors, 91–95; XVI: Construction of a range table, 96–102; Supplement A: Trajectory computation by the tangent reciprocal method, 103–104; B: Explanation of the signs in the computation of differential corrections, 105–106; C: Dimensions of ballistic symbols, 107–108; D: Antiaircraft fire, 109–110; E: Derivation of two equations of Chapter VII, 111–113; F: A derivation of Theorem I, 114–115; G: New methods of trajectory computation, 116–119; H: Note on advancing difference formulas, 120–121; Index, 123–127.

NOTES.

The third volume of *Fundamenta Mathematicae* (see *1921*, 318) appeared in April. It contains 323 pages, consisting of 29 papers + problems proposed and lists of exchanges. The only American authors are R. L. Moore, "Concerning connectedness im kleinen and a related property," 232–237, and J. R. Kline, "A theorem concerning connected point sets," 238–239.

Volumes 85 and 86 of *Mathematische Annalen* (see *1921*, 135) have been published. The following articles are by American writers—In volume 85: A. J. Kempner, "Über die Separation komplexer Wurzeln algebraischer Gleichungen," 49–59; E. R. Hedrick and W. D. A. Westfall, "The existence domain of implicit functions," 74–77; E. J. Wilczynski, "Charakteristische Eigenschaften der isothermkonjugierten Kurvennetze," 208–212; E. Kasner, "The solar gravitational field completely determined by its light rays," 227–236. In volume 86: O. D. Kellogg, "On the existence and closure of sets of characteristic functions," 14–17; E. H. Moore, "On power series in general analysis," 30–39.

A. Hermann, 6 rue de la Sorbonne, Paris, is offering for sale the volumes in the mathematical libraries of Monsieur Lebon and Professor Camille Jordan, and Professor Pierre Boutroux.

The mathematical library of the late Paul Mansion (d. 1919), long professor of mathematics at the University of Ghent, is to be presented to the University of Louvain as soon as a library building has been erected. One of Professor Mansion's sons is a professor at the University of Louvain, and another is professor at the University of Liége.

In accordance with the terms of the Treaty, volumes from the various libraries of Germany are now being assembled at Leipzig for the University of Louvain. The ruins of the old L-shaped library still stand much as after the fire. The corner stone of the building for the great new library was laid July 28, 1921, and work on the foundations is now being carried on. The inscription on the corner stone is: "Lapis primarius Bibliothecae Lovaniensis nobiliter reficiendæ."

ARTICLES IN CURRENT PERIODICALS.

American Journal of Mathematics, volume 43, October, 1921: "On some properties of general manifolds relating to Einstein's theory of gravitation" by J. A. Schouten and D. J. Struik, 213–216; "Geometrical theorems on Einstein's cosmological equations" by E. Kasner, 217–221; "On the Fermat and Hessian points for the non-euclidean triangle and their analogues for the tetrahedron" by C. M. Sparrow, 222–225; "The Cauchy-Lipschitz method for infinite systems of differential equations" by W. L. Hart, 226–231; "Boundary value and expansion problems; formulation of various transcendental problems" by R. D. Carmichael, 232–270; "Reciprocity in a problem of relative maxima and minima" by J. K. Whittemore, 271–290.

Bulletin des Sciences Mathématiques, volume 46, February, 1922: "A propos de quelques livres sur la théorie de la relativité" by J. Villey, 61–96—March: "Vue d'ensemble sur les machines à calculer" by M. D'Ocagne, 102–144—April: "Sur les fonctions qui admettent un théorème d'addition algébrique" by H. Mineur, 156–176.

Il Bollettino di Matematica, new series, volume 1, nos. 1–3, 1922: "Su alcuni problemi relativi all'equivalenza dei poligoni" by C. Ciamberlini, 1–4; "Sui criteri di eguaglianza dei triangoli" by R. La Marca, 5–9; "Le soluzioni intere della equazione $1/x + 1/y = 1/z$" by C. Ruggeri, 10–15; "Aggiunte ad una nota su 'Particolari progressioni aritmetiche e geometriche' " by L. Tenca, 16–21. "Sezione storico-bibliografica": review by G. Vivanti of Hadamard, *Four Lectures on Mathematics delivered at Columbia University in 1911* (New York, 1915), xi–xiii; review by G. L(oria) of C. J. Keyser, *The Humor Worth of Rigorous Thinking. Essays and Addresses* (New York, 1916), xix–xxi.

Esercitazioni Matematiche, volume 1, November–December, 1921: "La dimensionalità dello spazio" by B. Levi, 203–208; "Riduzione di una sostituzione lineare a forma canonica" by M. Cipolla, 209–220—Volume 2, January–February, 1922: Review by G. Mignosi of J. W. Young, *Fundamental Concepts of Algebra and Geometry,* Italian translation by D. Mercogliano, with preface by G. Loria, 50–53—March–April: "Le sostituzioni lineare che non alterano una quadrica" by G. Mignosi, 80–88; "La commemorazione di Ulisse Dini," 104–108; Letter from D. Mercogliano in regard to the review by G. Mignosi of Young's *Fundamental Concepts of Algebra and Geometry,* 121–123.

Nature, volume 109, May 6, 1922: "Text-books of elementary mathematics" by H. B. H., 574–576 [Brief notice of several text-books including Osgood, *Elementary Calculus* (Macmillan, New York, 1921)]; "Pythagoras's theorem as a repeating pattern" by J. R. Cotter, 579—May 20: "The general theory of relativity" by A. S. E., 634–636 [Review of H. Weyl, *Space—Time—Matter* (London, 1922)]; "On immediate solutions of some dynamical problems" by A. Gray, 645–647—June 3: "G.B.M." by A. Gray, 712 [Reminiscences of G. B. Mathews]; "The elliptic logarithmic spiral—a new curve" by H. S. Rowell, 716.

La Nature, volume 50_1, April 29, 1922: "Le télescope géant de M. Mac Afee et les canaux de Mars" by A. T., 270—May 13: "Einstein au Collège de France, Conférence de M. Einstein" by M. Morand, 298–303 (to be continued)—May 20: "Einstein au Collège de France, Discussion sur les théories" by M. Morand, 315–320.

Periodico di Matematiche, series 4, volume 2, March, 1922: "Sulla teoria della relatività" by G. Todesco, 125–135 ["Dalle conferenze di Einstein a Bologna. Prima conferenza: Il principio speciale di relatività"]; " L' invenzione dei logaritmi" by A. Agostini, 135–150; "Assiomi e ipotesi dei *Fondamenti di Geometria* del Veronese" by F. Palatini, 150–163; "Sopra una proprietà del cerchio dei nove punti" by R. Zappa, 164–173; "Prof. Umberto Scarpis," 219–220 [Tribute of the Council of the Italian Society, Mathesis]—May: "Sulla teoria della relatività" by G. Todesco, 221–236 ["Seconda conferenza: La relatività generale"]; "Gli incommensurabili e il procedimento euclideo del massimo comun divisore" by P. Cattaneo, 236–245; "Sulle funzioni iperboliche" by V. Notari, 246–260.

Philosophical Magazine, sixth series, volume 42, November, 1921: "On the transformation of the equation of motion of the dynamics of continuous media in the restricted principle of relativity" by H. T. Flint, 794–799; "The relativity of field and matter" by A. S. Eddington, 800–806; "On the postulates and conclusions of the theory of relativity" by L. T. More, 841–852—Volume 43, January, 1922: "The derivation of symmetrical gravitational fields" by F. D. Murnaghan, 19–31 ["In the usual treatment of this problem a field is said to be symmetrical about a point if the form for $(ds)^2$ is invariant under linear orthogonal transformations of the 'Cartesian coördinates' (x_1, x_2, x_3); then a transformation is made to 'polar coördinates' r, θ, ϕ, where $r = \sqrt{x_1^2 + x_2^2 + x_3^2}$, etc., and an appeal is made, in choosing a form for $(ds)^2$, to the corresponding form in Euclidean space. Now the essential assumption in the relativity theory of a permanent gravitational field is that the physical space-time continuum of four dimensions is *non*-Euclidean; the term 'Cartesian coördinates' for a non-Euclidean space requires definition, and the equation for r given above assumes an underlying Pythagorean theory that is not tenable for non-Euclidean spaces in general. Since the only existing experimental verifications of the relativity *gravitational theory* are based on the expression for $(ds)^2$ in a permanent symmetrical gravitational field, it is desirable that the assumptions in the mathematical treatment should be clearly stated."]; "On the significance of Einstein's gravitational equations in terms of the curvature of the world" by A. S. Eddington, 174–177 [Revision of a proof in volume 42, p. 800];

"On a graphical solution of a class of differential equations occurring in wireless telegraphy" by A. A. Robb, 206–215 [Given an equation of the type $d^2p/d\omega^2 + f(p)\cdot dp/d\omega + p = 0$, the expression $d^2p/d\omega^2 + p$ may be interpreted as the radius of curvature of a curve from which by mechanical means a second curve is drawn whose polar equation is a solution of the given equation. (Compare F. V. Morley's derivation of the differential equation arising from the curve of pursuit problem, *1921*, 55)]—February: "Method of tracing caustic curves" by A. S. Percival, 258–277—March: "The relation between the projective and the metrical scales, and its bearing on the theory of parallels" by L. Silberstein, 420–429; "The deflexion of a ray of light in the solar gravitational field" by F. D. Murnaghan, 580–588; "The identical relations in Einstein's theory" by G. B. Jeffery, 600–603—April: "On products of Legendre functions" by J. W. Nicholson, 768–784—May: "Circular plates of variable thickness" by G. D. Birkhoff, 953–962.

POPULAR ASTRONOMY, volume 30, June–July, 1922: "Photograph of a small tornado," 325–326; "The present position of the island universe theory of the spiral nebulæ" (concluded) by D. B. McLaughlin, 327–339; "Aberration and relativity" by W. H. Pickering, 340–343; "A universal scale for the solution of astronomical problems" by J. E. G. Yalden, 352–356 [Describes a device for the graphical solution of astronomical problems].

PROCEEDINGS OF THE LONDON MATHEMATICAL SOCIETY, series 2, volume 20, part 6, February, 1922: "On double surfaces" by B. M. Sen, 417–434—Part 7, April, Prefatory Matter: "Lord Rayleigh" by H. L., xliii–xlvii; "Adolf Hurwitz" by W. H. Y., xlviii–liv.

PROCEEDINGS OF THE ROYAL SOCIETY, series A, volume 100, December 1, 1921: "The principles of internal ballistics" by J. Proudman, 289–305—Volume 101, April 1, 1922: "The design of repeating patterns.—Part I" by P. A. MacMahon and W. P. D. MacMahon, 80–94 [Abstract in *Nature*, November 24, 1921, p. 421 (see *1922*, 75)]; "Correlation between arrays in a table of correlation" by C. Spearman, 94–100.

PROCEEDINGS OF THE ROYAL SOCIETY OF EDINBURGH, volume 41, part 2, 1920–21: "Note on a continuant of Cayley's of the year 1874" by T. Muir, 111–116.

QUARTERLY JOURNAL OF PURE AND APPLIED MATHEMATICS, volume 49, December, 1921: "On recurrences for sums of divisors" by E. T. Bell, 186–192.

RENDICONTI DEL CIRCOLO MATEMATICO DI PALERMO, volume 45, 1921: "On the relation between the Hilbert space and the calcul fonctionnel of Fréchet" by E. W. Chittenden, 265–270; "Orbits asymptotic to the straight line equilibrium points in the problem of three finite bodies" by D. Buchanan, 332–356—Volume 46, fasc. 1, 1922: "The Cauchy problem on the equation of telegraphy" by T. Hayashi, 117–121.

REVUE GÉNÉRALE DES SCIENCES, volume 33, April 15, 1922: "A propos de la théorie d'Einstein" by J. Richard, 193–194; "Sur la possibilité de se représenter l'espace fini et sans bornes de la théorie de la relativité" by R. Thiry, 205–209—April 30: "Sur la notion de courbure de l'espace" by R. Thiry, 225; "Coup d'œil sur les principes fondamentaux de la nomographie en quels cas et comment ils permettent de réduire à une représentation plane des dimensions en nombre supérieur à trois" by M. d'Ocagne, 230–239; "La démonstration scientifique" by R. d'Adhémar, 239–244 (to be continued)—May 15: "La démonstration scientifique" by R. d'Adhémar, 268–276.

PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL, OTTO DUNKEL, AND H. P. MANNING.

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PROBLEMS FOR SOLUTION.

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2972. Proposed by J. H. M. WEDDERBURN, Princeton University.

In *Mathematical Education*, p. 361, B. Branford gives the following approximate construction